



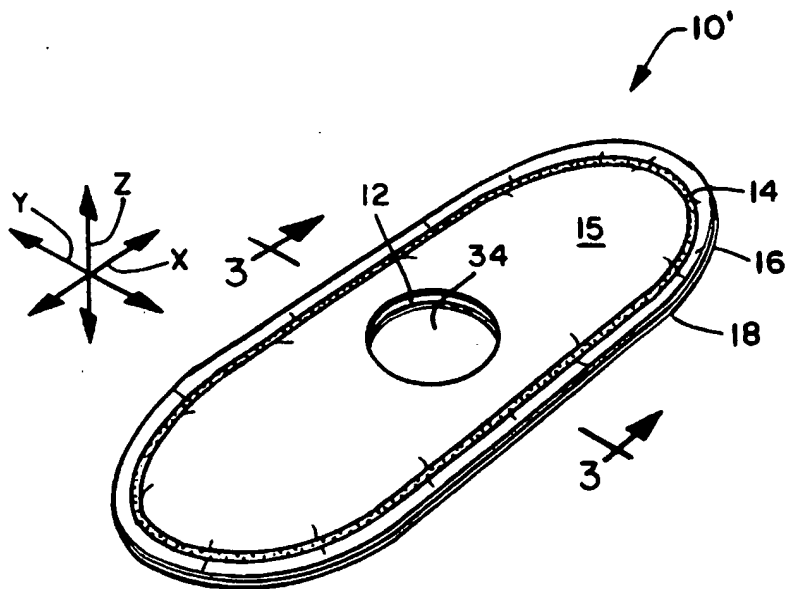
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: ABSORBENT ARTICLE HAVING A BODY ADHESIVE

## (57) Abstract

A self-supporting absorbent article adapted for use in the general area of a human torso is disclosed. The article includes an absorbent and an adhesive disposed adjacent to the absorbent which is designed to contact the wearer's body. The absorbent article has a total weight greater than about 5 grams.



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## ABSORBENT ARTICLE HAVING A BODY ADHESIVE

### FIELD OF THE INVENTION

5        This invention generally relates to disposable absorbent articles, and particularly to absorbent articles adapted to be self supporting and secured to the wearer. More particularly, this invention relates to sanitary napkins for personal feminine hygiene that may be secured to the wearer's body.

10

### BACKGROUND OF THE INVENTION

      All manner and variety of absorbent articles configured for the absorption of body fluids such as menses, urine and feces are well known. With respect to feminine protection devices, the art has offered two basic types: sanitary napkins and tampons. Sanitary napkins, for the purposes described herein includes thin devices denoted as panty liners and interlabial pads, have been developed for external use about the pudendal region of a female while tampons have been developed for internal use within the vaginal cavity for interruption of menstrual flow therefrom. Each has offered distinct advantages.

20

A tampon is constructed of natural absorbent material such as cotton, synthetic materials, such as polyethylene or rayon or combinations thereof. Because the tampon is hidden and does not disclose the fact that the wearer is menstruating, it is  
5 stylistically preferable to the sanitary napkin. However, its use is interdicted in a number of situations: in some women use of a tampon is physically uncomfortable; its use is not acceptable immediately after childbirth or during post-surgical periods, or when  
10 pathological conditions exist; and lastly when menstrual flow is very heavy, the tampon may have insufficient capacity to absorb secretions making the sanitary napkin necessary to supplement or supplant the tampon.

With respect to sanitary napkins, an important objective is to control the absorption and flow of exudate or body fluids in a manner  
15 which obtains maximum utilization of the available absorbent. Ideally, a sanitary napkin is expected to immediately accept all body fluid discharged, rapidly transport the fluid away from the point of discharge, contain the transported fluid within the marginal confines of the napkin, and maintain the body contacting surface as dry as  
20 possible.

The prior art describes many sanitary napkins that have addressed one or more of the above expectations. Improvements to the sanitary napkin's absorbency have included, among other things, the addition of superabsorbents into the absorbent batt and various  
25 methods to improve body contact. In the latter, at least three general designs exist. One design includes forming the napkin into a cup or boat shape which is intended to catch the menses as it exits the vaginal orifice.

A second design includes those sanitary napkins that are raised upwardly or humped in their medial portions so as to be near or in contact with the pudendal region when worn. These sanitary napkins attempt to contact and absorb menses immediately as it leaves the  
5 vestibule. Such humps or raised areas have been formed from additional medial absorbent or the incorporation of a flexure-resistant deformation element.

The third design include those sanitary napkins that are not predisposed to have a trough or a hump shape when worn, but instead  
10 have a more or less rope-like shape when worn. Such sanitary napkins typically have a fluff pulp absorbent core surrounded by flexible outer wraps.

Securement of the sanitary napkin during use is generally accomplished by attaching the sanitary napkin to the wearer's  
15 undergarment by a pressure sensitive adhesive. The prior art also teaches the use of wings and flaps which fold over the edges of the elastic sides of the crotch portion of an undergarment and which may then be secured underneath using an adhesive. The prior art further teaches using panels with mechanical fasteners.

20 These methods of securing a sanitary napkin to an undergarment can exhibit a number of drawbacks. One drawback is that the adhesive can stick to the inside surface of the undergarment and cause discoloration. Another is the napkin will tend to move with the undergarment rather than the body of the wearer. This can result in  
25 a less secure fit and increase incidence of fluid leakage, irritation, and chafing.

Now a sanitary napkin with a body adhesive has been invented which improves the fit with the curve of the human body, is comfortable to wear, and is effective in preventing fluid leakage.

5

#### SUMMARY OF THE INVENTION

Briefly, this invention relates to a disposable absorbent article having a total weight greater than about 5 grams and adapted to be secured to the torso about the pudendal region of a human. The  
10 absorbent article includes an absorbent and a body side adhesive secured to the absorbent. The absorbent materials are designed to absorb body exudates, including menstrual fluids, catamenial fluids, blood and urine.

The body side adhesives used in the invention are of the type  
15 that exhibit suitable adhesion properties to skin but which can be removed without appreciable discomfort. The purpose of the adhesive is to secure the absorbent proximate the wearer, improving body to article contact. The adhesives typically have a peel force of from about 25 to about 700 grams. Because of the absorbent articles  
20 intimate contact with the wearer, it is also advantageous for the absorbent's surface distal the wearer to be liquid-impermeable. Liquid impermeability can be accomplished by means well known in the art, and include securing a thin polyethylene backsheet to the absorbent or coating the absorbent fibers with a hydrophobic  
25 material.

The general object of the present invention is to provide an absorbent article, such as a sanitary napkin, disposable diaper, incontinent pad, and the like, that is adhesively secured to the wearer's body.

5        Another object of this invention is to provide a thin and flexible absorbent article which will, by the mere act of putting it on, will closely conform to and fit the external body surfaces.

      Still another object of this invention is to provide an absorbent article which obviates the need for a frictional supporting  
10 means, resulting in a more comfortable body conforming absorbent article.

      Another object of the invention is to provide a sanitary napkin that uses an adhesive applied to the body facing surface to secure the napkin to the wearer.

15       Yet another object of this invention is to provide a sanitary napkin which when secured to the wearer's body is, for all practical purposes, invisible in outline underneath the wearer's garments.

      These and other objects of the present invention will be more fully apparent from the following description when taken in  
20 connection with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

      Figure 1 is a perspective view of an absorbent article having a body adhesive located about its periphery and having a body side,  
25 removable member partially pulled back.

      Figure 2 is a perspective view of another embodiment of an absorbent article showing a longitudinally and transversely centered aperture through the topsheet and absorbent.

Figure 3 is a cross-sectional view of Figure 2 taken along line 3--3.

Figure 4 is a top view of another embodiment of an absorbent article having an upper surface which is at least partially overlaid by a backsheet.

Figure 5 is a cross-sectional view of Figure 4 taken along line 5--5 showing the adhesive partially residing on the topsheet and the backsheet.

Figure 6 is an alternative cross-sectional view of an alternative embodiment of Fig. 5 taken along line 5--5 showing the backsheet extending over the absorbent's periphery and the adhesive residing completely on the backsheet.

Figure 7 is a top view of another embodiment showing an aperture in the topsheet and having a flattened front portion and a rearward portion having a ridge or peak.

Figure 8 is a side view of Figure 8 illustrating the flattened front portion and the peaked rearward portion. The body adhesive is shown around the periphery of the absorbent.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates generally to disposable absorbent articles having a total weight greater than about 5 grams that are secured to the body of a user by a pressure sensitive body adhesive. For convenience of description of only, the invention will be described as applied to a catamenial device, i.e. a sanitary napkin, but is not limited thereto. It is to be understood that the invention may be adapted for use in other absorbent articles such as diapers, incontinent devices and the like.



For ease of understanding, when referring to the Figures, the same numeral designates the same part in the different views and embodiments. Referring to Figure 1, an embodiment of a sanitary napkin 10 is shown.

5 In the most basic embodiment, the sanitary napkin 10 includes an absorbent 12 and a body side adhesive 14 disposed toward the wearer's body and secured to the absorbent 12. The adhesive 14 secures the sanitary napkin 10 to the wearer's body.

As used herein, the term "sanitary napkin" refers to an  
10 article which is worn by females adjacent to the pudendal region and which is intended to absorb and contain various exudates which are discharged from the body such as blood, menses, and urine, and which is intended to be discarded after a single use. Interlabial devices which reside partially within and partially external of the female  
15 wearer's vestibule are also within the scope of this invention.

The sanitary napkin 10 preferably has a total weight of less than about 12 grams. The sanitary napkin 10 an oval shape, but it can be an hourglass, racetrack or any other design that will allow the absorbent article to come into intimate contact with the wearer.  
20 The sanitary napkin 10 has a body side surface 15 which can include a liquid-permeable topsheet 16 proximate the wearer's body; a liquid-impermeable backsheet or baffle 18 that is distal the wearer's body; an absorbent 12 positioned intermediate the topsheet 16 and the backsheet 18; and a pressure sensitive, body side adhesive 14 secured  
25 to the body side surface 15. The adhesive 14 secures the sanitary napkin 10 to the wearer's body. Generally, the sanitary napkin 10 is provided with a removable member 20 that is a releasably secured material for protecting the adhesive 14 from contamination and which

advantageously protects the topsheet 16 from preplacement soiling until the member 20 is removed and the sanitary napkin 10 is appropriately positioned for use.

Referring to Figures 2 and 3, the sanitary napkin 10' illustrates the topsheet 16 and the backsheet 18 having generally a length and a width dimension sized larger than the absorbent 12 so that they extend beyond the outer perimeter 22 of the absorbent 12 to form a peripheral edge 24. The backsheet 18 is coextensive and in face to face contact with the topsheet 16, and includes a surface 26 facing toward and disposed under the absorbent 12. The topsheet 16 and the backsheet 18 are sealed together from the absorbent perimeter 22 to the peripheral edge 24 in any suitable manner that does not leave a hard, uncomfortable residue that would be annoying to the wearer. As used herein, the term "sealed" encompasses configurations whereby a first member is directly joined to a second member and configurations whereby a first member is indirectly joined to a second member by affixing the first member to intermediate members which in turn are affixed to the second member. Means of attachment are well known to those skilled in the art and include the use of hot melt adhesives in a uniform and continuous layer, patterned adhesives, pressure sensitive adhesives, double sided tape, sonic bonding, and heat sealing.

The absorbent 12 has a first surface 28 and a second surface 30. The first surface 28 is disposed toward the topsheet 16 and the second surface 30 is disposed toward the backsheet 18. The absorbent article can include a wicking layer 32. The wicking layer 32 is positioned adjacent to the second surface 30. The purpose of the wicking layer 32 is to route body fluid which contacts the

topsheet 16 down to the absorbent 12. The wicking layer 32 may include more than one material having wicking characteristics.

The first and second surfaces 28 and 30 respectively, of the absorbent 12 have a coaxially aligned aperture 34 formed therethrough. Although not a necessary feature, the aperture 34 can extend through the topsheet 16 so that body fluid will not have to permeate through the topsheet 16 before contacting the absorbent 12. Preferably, the aperture 34 extends through the wicking layer 32. This arrangement allows the aperture 34 to act as a conduit to rapidly transport any sudden gush of body fluid away from the point of discharge to the absorbent's second surface 30, which is positioned on the bottom of the absorbent 12. This arrangement also allows the topsheet 16, the absorbent 12, and the backsheet 18 to act as a reservoir to surround and contain the discharged body fluid until it is absorbed by the absorbent 12. The backsheet 18 can have between about 5% to about 95% of its surface 26 bonded to the adjacent layer 32. Most preferably, the backsheet 18 is marginally secured to the adjacent layer 32.

As shown in Figures 1-3, the body adhesive 14 is positioned inward from the peripheral edge 24 of the sanitary napkin 10 and 10'. The purpose of the adhesive 14 is to secure the sanitary napkin 10 and 10' to the body of the wearer. As illustrated in Figure 3, the adhesive 14 is disposed adjacent to the topsheet 16, overlying the perimeter 22 but can be secured up to about 3 centimeters from the perimeter 22 of the absorbent 12. Although the adhesive 14 is depicted as a continuous, uniform layer, it is to be understood that those skilled in the art can readily select a different pattern for adhesive attachment. For example, an intermittent pattern of

adhesive 14 may be applied. The adhesive 14 is superimposed over less than about 85% of the body side surface 15 of the sanitary napkin 10, more preferably less than about 50%, and most preferably less than about 25%.

5       The adhesive 14 is usually covered, prior to the time sanitary napkin 10 is affixed to the person, with a removable member 20. The removable member 20 serves to protect the adhesive 14 from adhering to extraneous surfaces prior to use and to prevent contamination of the adhesive 14. Advantageously, the member 20 also prevents the  
10       topsheet 16 from becoming prematurely soiled prior to placement against the wearer's body. Suitable cover materials can be any material that is capable of being releasably secured to the adhesive 14 and includes those materials commonly used to protect the garment attachment adhesive presently used on commercially sold  
15       sanitary napkins. Non-limiting examples include a silicone coated Kraft paper, SILOX E1-0 and BL30MG-A SILOX 4P/0 manufactured by Akrosil Corporation.

      The liquid-permeable topsheet 16 is designed to contact the body of the wearer and can be constructed of a woven or nonwoven, natural  
20       or synthetic material which is easily penetrated by body fluid. Suitable materials include bonded carded webs of polyester, polypropylene, polyethylene, nylon, or other heat-bondable fibers. Other polyolefins, such as copolymers of polypropylene and polyethylene, linear low-density polyethylene, finely-perforated film  
25       webs and net material, also work well. Particularly preferred are composite materials of a polymer and a nonwoven fabric material. The composite sheets are generally formed by extrusion of the polymer onto a web of spunbonded material to form an integral sheet. This

material is preferred, because the outer fabric surface is not irritating to the skin of the wearer. Still another material for the topsheet 16 is a spunbond web of polypropylene. The web can contain about 1% to about 6% titanium dioxide pigment to give it a clean, white appearance. A uniform spunbond material is desirable, because it has sufficient strength, after being perforated in the longitudinal direction, to resist being torn or pulled apart during use. The most preferred polypropylene webs have a weight of between about 18 and 40 grams per square meter. An optimum weight is between about 30 and about 40 grams per square meter.

The topsheet 16 can also be treated with a surfactant to improve its hydrophilic characteristics and, thereby, aid in the absorption of the liquid. The surfactant can include topical additions or internally applied materials like polysiloxanes.

The backsheet 18 can permit the passage of air or vapor out of the sanitary napkin 10 while blocking the passage of body fluids and liquids from the absorbent 12. A good material is a micro-embossed, polymeric film, such as polyethylene or polypropylene. Bi-component films can also be used as well as woven and nonwoven fabrics which have been treated to render them liquid-impermeable. The backsheet 18 can be made from a polyethylene film. Most preferably, the backsheet 18 comprises a polyethylene film having a thickness in the range of from about 0.012 mm to about 1.0 mm. The backsheet 18 should be soft and compliant. As used herein, the term "compliant" refers to materials which will readily conform to the general external shape and contours of the human anatomy.

In a preferred embodiment of the present invention, the backsheet 18, besides being secured to the topsheet 16 as described above, can have from about 5% to about 95% of the surface 26 positioned underneath the absorbent 12 secured to the adjacent layer 32. Preferably, less than about 50% of the surface 26 is secured, and more preferably, less than about 20%. Most preferably, the surface 26 is only marginally secured to the adjacent layer 32. This arrangement allows the backsheet 18 to separate, distending downward, from the absorbent 12, thereby acting similar to a fluid reservoir for holding sudden rushes of body fluid.

The topsheet 16 and the backsheet 18 will, in combination, enclose the absorbent 12, substantially defining the absorbent's perimeter 22. The absorbent materials used in the absorbent article 10 are designed to absorb body exudates, including menstrual fluids, catamenial fluids, blood and urine. Suitable materials include wood pulp fluff, rayon, cotton and meltblown polymer, such as polyester, polypropylene or coform. Coform is an air-formed combination of meltblown polymers, such as polypropylene, and absorbent staple fibers, such as cellulose. A preferred material is wood fluff, for it is low in cost, relatively easy to form and has good absorbency. The absorbent 12 may be a composite comprised of a hydrophilic material that can be formed from various natural or synthetic fibers, wood pulp fibers, regenerated cellulose or cotton fibers, an airlaid tissue or a blend of pulp and other fibers. The absorbent 12 can be made from other well known materials used in absorbent articles, including multiple layers of cellulose wadding, rayon fibers, cellulose sponge, hydrophilic synthetic sponge, such as polyurethane, and the like. The absorbent 12 can have varying

densities in the Z direction. The term "Z direction" as used herein means in the direction of the sanitary napkin thickness, where X and Y directions would be along the length (longitudinally) and width (transversely) of the sanitary napkin 10, respectively, see Figure 2.

5 Preferably, the first surface 28 of the absorbent 12 is of a lower density than the second surface 30. This assists in drawing any body fluid toward the backsheet 18 and in reducing and/or preventing the fluid from permeating back toward the wearer a phenomenon known as "rewet."

10 Although the sanitary napkin 10 is described as having a single layer of absorbent material forming the absorbent 12, the absorbent 12 may include more than one layer of absorbent material. As viewed looking downward from the topsheet 16 toward the backsheet 18, each successive absorbent layer, if used, preferably  
15 has a density and a liquid absorption capacity greater than the preceding absorbent layer. It should be emphasized that the values relating to absorbency are relative for any particular style of absorbent article. It is, therefore, quite possible that one particular style of absorbent article may utilize the same material  
20 in its second absorbent layer as that utilized as the first absorbent layer in another absorbent article.

The absorbent 12 may contain superabsorbent particles which are extremely effective in retaining body fluids. Superabsorbents have the ability to absorb a large amount of fluid in relation to their  
25 own weight. Typical superabsorbents used in absorbent articles, such as sanitary napkins, can absorb anywhere from about 5 to about 60 times their weight in body fluids. However, the absorption mechanism

of the superabsorbents is usually slower than the rate of fluid absorption by cellulose fluff material.

It has been found that superabsorbents have a high mechanical stability in the swollen state, an ability to rapidly absorb fluid, and those having a strong liquid-binding capacity perform well in catamenial devices. Hydroxyfunctional polymers have been found to be good superabsorbents for this application. The superabsorbent can be a hydrogel forming polymer composition which is water-insoluble, slightly cross-linked, and partially neutralized. Such superabsorbents can be obtained from Dow Chemical, Hoechst-Celanese, and Stockhausen, Inc.

The sanitary napkin 10 and 10' can include a wicking layer 32. The wicking layer 32 is positioned adjacent to the second surface 30 of the absorbent 12. The wicking layer 32 performs the function of distributing the body fluid to and across the second surface 30 of the absorbent 12. Thus, any material having sufficient capillary activity, or other means to attract and transport body fluid coming into intimate contact with its surface, and thereby distributing the discharges across the whole of the absorbent 12, can be used. The wicking layer 32 can be comprised of a fibrous material having little absorption ability. Suitable materials include blends of polyester and rayon that have minimum fluid retaining character. Other materials may be airformed or carded webs of polyester, rayon, or polypropylene. A preferred material for the wicking layer 32 is a meltblown polypropylene layer having a thickness of about 0.6 mm, a weight of about 60 grams per square meter, a pore size of about 10.6 micrometers, and a mean fiber diameter of about 3.9 micrometers.



The wicking layer 32 can be coextensive with the second surface 30 of the absorbent 12. Preferably it is of a size less than that of the absorbent 12, thereby having a peripheral edge 36 located inboard from the outer perimeter 22 of the absorbent 12. The wicking layer 32 can range from about 10 mm to about 65 mm in width and from about 5 mm to about 180 mm in length. The wicking layer 32 can have a wicking rate equal to the wicking rate of the second surface 30 of the absorbent 12 to facilitate liquid transport. Preferably, the wicking layer 32 has a wicking rate greater than that of the second surface 30. Wicking rates may be determined in accordance with the procedure set forth in U.S. Pat. No. 4,256,111, issued to Lassen on March 17, 1981, and which is incorporated by reference and made a part hereof.

The sanitary napkins 10 and 10' are provided with similar body side adhesive 14 for retaining the sanitary napkin 10 and 10' against the wearer's vulvar region so only 10' will be described in detail. The body facing surface 15 is coated with the body side adhesive 14. The adhesive 14 is generally disposed within a distance of about 3 centimeters (cm) from the perimeter 22 of the absorbent 12, including the outer perimeter 22 thereof. The adhesive 14 may be applied as a continuous or intermittent pattern. The thickness and surface area of the adhesive 14 may also vary. The adhesive 14 should be superimposed over less than about 85% of the body facing surface 15 of the sanitary napkin 10', preferably less than about 50%, and most preferably, less than about 25%. Nonlimiting factors which effect the adhesion of the sanitary napkin 10' to a wearer include: the strength of the adhesive 14; the location of the adhesive 14 on the sanitary napkin 10'; whether the adhesive 14 will

lie on the wearer's skin or will primarily be intermingled with body hair; and the size, weight, and shape of the sanitary napkin 10'. Accordingly, adhesives for use in this invention should have an adequate adhesive force to retain the sanitary napkin 10' against the wearer during static and dynamic conditions but will release from the skin and hair without a high level of discomfort. In a preferred embodiment, the sanitary napkin 10' has a total weight ranging from between about 5 grams and less than about 12 grams. The term "total weight" as used herein means the weight of the sanitary napkin 10' without the removable member 20 and before it has acquired any fluids in use. It has been discovered that suitable adhesives for use have an adhesive peel force, as determined by a modified Pressure Sensitive Tape Council peel resistance test (PSTC-1) described below, of from about 25 grams to about 700 grams. The peel force is preferably from about 100 grams to about 650 grams, more preferably from about 100 grams to about 450 grams, and most preferably from about 100 grams to about 400 grams. PSTC-1 is a standardized test procedure that is described in greater detail on page 23 of the tenth edition of Test Methods copyright 1992, available from Pressure Sensitive Tape Council 401 North Michigan Ave., Chicago, Ill. 60611-4267.

Additionally, suitable adhesives have the rheological properties loss modulus ( $G''$ ), storage modulus ( $G'$ ) and loss tangent ( $\tan \delta$ ) falling within the ranges of Table 1 below. The terms "loss tangent" ( $\tan \delta$  or  $G''/G'$ ) and "storage modulus" ( $G'$ ), are defined according to established principles of dynamic mechanics. These rheological quantities are measured on bulk adhesive samples not suspended on any substrate and having a thickness of approximately 0.56 mm. The

adhesive is cut into a 25 centimeter (cm) circle and placed between two 25 cm parallel plate fixtures of a Rheometrics Dynamic Spectrometer (RDS), which can be obtained from Rheometrics located at 1 Possum Town Road, Piscataway, New Jersey 08854. The upper platen is lowered onto the sample until the normal force meter indicates a slight deflection. The samples are allowed to equilibrate at the test temperature (e.g. 25°C. and 37°C.) before testing. A minicomputer governs the application of a 5% peak-to-peak shear strain to the sample. The frequency of the application can be controlled to a fraction of a radian/sec (one radian is equal to 6.28 Hz). The values of the complex modulus ( $G^*$ ) and loss tangent ( $\tan \delta$ ) are calculated by the computer from geometry factors, peak-to-peak amplitude of the torque signal, and phase lag of the torque output wave. The definition of loss tangent ( $\tan \delta$ ) and the relationship between  $G^*$ ,  $G'$ , and  $G''$  provide two equations in two unknowns which can be solved by the computer to provide  $G''$  and  $G'$ , since  $G^*$  and loss tangent ( $\tan \delta$ ) are both known values calculated as described previously. For any of these values, the frequency is 10 radian/sec.

TABLE 1

<u>Property</u>	<u>Values in <math>10^4</math> dynes/cm<sup>2</sup> at 25-37°C.</u>
25 Loss Modulus ( $G''$ ) Storage Modulus ( $G'$ )	0.5 to 20 0.2 to 45
Loss Tangent ( $\tan \delta = G''/G'$ )	0.1 to 1.0

Nonlimiting examples of suitable adhesives include a pressure-sensitive, hydrophilic hydrogel adhesive material. Such hydrogel adhesives are marketed by Promeon Division of Medtronic, Inc., of Minneapolis, Minnesota, under the trademark "PROMEON" and  
5 include a commercial medical grade hydrogel marketed as PROMEON RG-63B. A detailed description of such a hydrogel composition is contained in U.S. Pat. No. 4,593,053, issued to Jevne et al., on June 3, 1986. Another suitable hydrogel adhesive is described in U.S. Pat. No. 4,699,146, issued to Sieverding on October 13, 1987.  
10 The disclosures of each of these patents are incorporated by reference and made a part hereof.

The peel force of the adhesive is determined by a test which is modeled after the PSTC-1 90° PEEL ADHESION PROCEDURE, the procedure being modified and performed as follows. The PEEL ADHESION PROCEDURE  
15 gives a force value related to a unidirectional removal force from a test subject's forearm.

#### APPARATUS

The apparatus used for the Peel Adhesion Procedure is an Instron  
20 model 4201 materials testing instrument or equivalent. Instron materials testing instrument is available from Instron Engineering Corporation, Canton Massachusetts.

#### PREPARATION OF SPECIMENS

25 In order to perform the procedure for this task, as explained below, no less than 5 test specimens are prepared. The test specimens are approximately 0.635 cm (1/4 inch) wide with a degree of variance no greater than 0.04 cm (1/64 of an inch). The test

specimens are approximately 15.24 cm (6 inches) in length. In the case where a non-hydrogel adhesive is to be tested, it is conditioned by placing the adhesive laminate strips in a  $73 \pm 2$  degree Fahrenheit and a relative humidity of  $50 \pm 2$  percent for 24 hours. The adhesive strips do not have the peel strip removed.

In the case where the adhesive is a hydrogel, it is tested at a residual moisture content of 25 percent, 35 percent, and 45 percent. In preparing the hydrogel samples for testing, all of the samples are conditioned to achieve the proper moisture content. Samples having a 25 percent moisture content are prepared by placing the hydrogel having a thickness of  $15 \pm 1$  millimeters on a nonwoven substrate. These laminates are placed in a  $130 \pm 2$  degree Fahrenheit oven with the adhesives exposed. After 45 minutes, the release liner is replaced on the samples and then they are sealed in a polyethylene bag.

Samples having a 35 percent moisture content are prepared by placing the adhesive laminates of hydrogel having a thickness of  $15 \pm 1$  millimeter on a nonwoven substrate. The laminates are then placed in a chamber having a temperature of  $73 \pm 2$  degrees Fahrenheit and a relative humidity of  $50 \pm 2$  percent for 6 hours. The samples are removed and the release liner is replaced on the samples and then they are sealed in a polyethylene bag.

Samples having 45 percent hydration are prepared by placing the adhesive laminates of hydrogel having a thickness of  $15 \pm 1$  millimeter on a nonwoven substrate. The laminates are placed in a chamber having a temperature of  $100 \pm$  degrees fahrenheit and relative humidity of  $80 \pm 2$  percent for 6 hours. The samples are removed and

the release liner is replaced on the samples and then they are sealed in a polyethylene bag.

The percent hydration is determined by evaporating the moisture from the adhesive laminate at 234 degrees Fahrenheit for eight (8) to  
5 twelve (12) hours. Hydration is determined by weight differences, that is, the weight of the nonwoven substrate is subtracted off the sample weights, then the weight of the sample having the moisture evaporated is divided by the original weight of the hydrogel adhesive.

10

#### PROCEDURE

The procedure for PEEL ADHESION PROCEDURE is as follows: The specimens are tested in a room having a temperature of  $73 \pm 3$  degrees Fahrenheit and a relative humidity of  $50 \pm 2$  percent. Because the  
15 adhesive is for attaching an absorbent article onto the body of a wearer, adhesion is tested on human arms. Attach one end of the 15.24 cm specimen to the forearm and drape the specimen along the length of the arm. Roll the test specimen lengthwise, once in each direction, using a 2.043 kilogram (4.5 pound) roller, at a speed of  
20 approximately 0.3048 meters per minute (twelve (12) inches per minute). After 5 minutes, peel back the free end of the test specimen at an angle of 90 degrees and peel 2.54 cm (1 inch) of the test specimen from the subject's forearm. Clamp that end from which the test specimen has been peeled into the movable jaw of the  
25 adhesion testing machine, allowing the subject's forearm to rest on the stationary portion of the adhesion testing apparatus. Operate the movable jaw at 5.08 and 10.16 meters per minute (200 and 400 inches per minute). After the movable jaw is started in motion,

disregard the values obtained while the first 2.54 cm of tape is removed. Use the average peel value obtained during the next 5.08 cm (2 inches) of removal as the adhesion value. The above steps are repeated until at least 5 similar specimens have been tested.

5

## CALCULATIONS

The peel adhesion for each specimen is the average force reading for that specimen.

10

## Comparative Example

The rheological data for an adhesive that is considered to be too aggressive for use but which can be used as a bandage adhesive is "DURO-TAK® 9908" from National Starch and Chemical Company, 10 Finderne Avenue, P O Box 6500, Bridgewater, New Jersey 08807-3300.

15

The test specimen was prepared according to the above procedure for determining rheological data. The results appear in TABLE 2 below.

TABLE 2

20

Property

Values in  $10^4$  dynes/cm<sup>2</sup> at  
25°-37°C and a frequency of  
10 radians/second

25°C37°C

25

Loss Modulus (G")

31

16

Storage Modulus (G')

62

52

30

Loss Tangent (Tan δ)

0.46

0.32

## EXAMPLE 2

35

In accordance with the above procedures, a number of peel strength test specimens were run using PROMEON hydrogel RG 63B as the adhesive.

The results appear in TABLE 3. Rheological data for the hydrogel appears in TABLE 4. All values are in  $10^4$  dynes/cm<sup>2</sup> and a frequency of 10 radians/second.

5

TABLE 3

90° PEEL STRENGTH

10	<u>Hydration</u>	<u>Contact Time</u>	<u>Speed (in/min)</u>	<u>Number of Tests</u>	<u>Peel Range (Grams)</u>	<u>Average (Grams)</u>
	25%	5 min.	200	45	31-402	164
		5 min.	400	44	58-405	190
15	35%	5 min.	200	46	83-601	236
		5 min.	400	46	81-628	268
20	44%	5 min.	200	46	57-386	169
		5 min.	400	46	70-511	218

25

TABLE 4

	<u>Property</u>	<u>25%</u>	<u>% Water Content</u>	
			<u>35%</u>	<u>45%</u>
	Loss Modulus (G'') @ 25°C	21	4.2	0.76
	Storage Modulus (G') @ 25°C	37	7.5	1.5
30	Loss Tangent (Tan $\delta$ )	0.63	0.55	0.47
	Loss Modulus (G'') @ 37°C	14	3.4	0.92
	Storage Modulus (G') @ 37°C	24	6.3	2.0
35	Loss Tangent (Tan $\delta$ )	0.59	0.55	0.47

Referring to Figures 4-6, another embodiment of a sanitary napkin 10" is shown. The sanitary napkin 10" has a body facing surface 15, a backsheet 18, an absorbent 12, and a wicking layer 22.

40 The absorbent 12 is advantageously provided with an aperture 34 extending through first and second surfaces, 28 and 30 respectively of the absorbent 12. The body facing surface 15 of the sanitary napkin 10" includes the liquid-permeable topsheet 16 and a portion of the backsheet 18.



The aperture 34 can be a variety of geometric configurations. The aperture 34 is coaxially aligned and extends through the topsheet 16 and more preferably extends through the wicking layer 32. The aperture can be substantially symmetrical in its shape and can be positioned along the longitudinal axis X--X. Preferably, the aperture 34 is longitudinally and transversely centered along the X--X and Y--Y axes, see Figure 4. The aperture 34 allows the sanitary napkin 10" to more completely acquire the sometimes highly viscous menses by allowing the backsheet 18 to accumulate the excess menses away from the topsheet 16 and proximate the second surface 30 of the absorbent 12. Without the aperture 34, less absorption of exudates may take place and the unabsorbed exudates may lay in contact with the body and cause irritation or may overflow the peripheral edge 24 of the sanitary napkin 10" and cause soiling. The aperture 34 preferably has an area great enough to be in contact with the menses as it exits the wearer's vagina yet not so large as to contact surrounding skin surfaces which could be soiled or irritated by rewet. The aperture 34 should be positioned on the body so that menses will contact the aperture 34 before contacting the rest of the topsheet 16.

Dimensionally, the aperture 34 ranges in size from about 10 mm to about 65 mm. If elliptical or of a similar shape having unequal dimensions, the aperture 34 may have a minor axis of from about 10 mm to about 35 mm and a major axis of from about 15 mm to about 85 mm and appropriately positioned on the sanitary napkin 10.

Referring to Figure 5 a cross-sectional view of Figure 4 along transverse axis Y--Y is shown. In forming the body facing surface 15, the backsheet 18 partially overwraps the topsheet 16. The backsheet 18 can extend over the topsheet 16, inward from the outer peripheral edge 24 of the sanitary napkin 10", by a distance from about 0.1 mm to about 30 mm.

Figure 6 shows a cross-sectional view taken along axis Y--Y of another embodiment of the sanitary napkin 10", as illustrated in Figure 4. The difference between the embodiments illustrated in Figures 5 and 6 is that in Figure 6 the backsheet 18 extends over the topsheet 16 by a sufficient distance to allow the adhesive 14 to reside on the backsheet 18 which is proximate the wearer. The

backsheet 18 can extend over the topsheet 16 sufficiently to allow the adhesive 14 to be completely affixed to the backsheet 18 facing the wearer's torso and inward from the perimeter 22. The backsheet 18 may be affixed to the topsheet 16 by means well known to those skilled in the art such as spaced apart strips of construction adhesive.

Referring to Figures 7 and 8, another embodiment of a sanitary napkin 100 is shown. The sanitary napkin 100 has the same plan form as sanitary napkin 10', illustrated in Figure 2 but with the following difference. The sanitary napkin 100 has a rearward portion 38 and a front portion 40. The rearward portion 38 includes a raised peak 42. The peak 42 forms a gradual rise from its beginning area immediate the aperture 34 to an end section 44 of the sanitary napkin 100. The raised peak 42 assists the wearer in properly placing the sanitary napkin 100 between her legs at the perineum and between her buttocks. The front portion 40 is generally flat as is best shown in Figure 8.

The raised peak 42 may be formed completely prior to delivery of the sanitary napkin to the consumer. Alternatively, the raised peak 42 may only be present in a precursor state that allows the user to form the peak 42 in its correct shape by folding the sanitary napkin 100 in the preferential fold that the precursor allows. This assists the user in forming the profile of the pad. Depending on the nature and composition of the absorbent and backing material, the raised peak 42 may be formed in many ways, including heat setting, thermoplastic containing absorbents, thermoplastic backing members, and scoring the components comprising the sanitary napkin 100 so that the raised peak 42 is formed when in use. Other approaches will occur to the skilled artisan for achieving the goal of providing the peak 42 fold line.

The length and height of the ridge or raised peak 42 in the rearward portion 38 of the sanitary napkin 100 is determined by the sharpness of the fold and the arrangement of the absorbent 12. The fold is useful for aligning the sanitary napkin 100 so that the aperture 34 is correctly aligned under the vestibule, and preferably under the vaginal opening, as the sanitary napkin 100 is being positioned on the body of the user. In use, the flattened portion 40

would be concave and extend generally over the mons pubis of the female anatomy and the forward portion of the labia. The raised peak 42 generally begins in the pudendal cleft rearward portion of the labia, adjacent the vestibule and extends toward the perineum and  
5 buttocks.

Use of the sanitary napkins 10, 10', 10" or 100 is similar. The removable member 20 is first removed, exposing the body adhesive 14 upward and toward the user. The aperture 34 can be used to assist the wearer in positioning the sanitary napkin 10' so that the  
10 aperture 34 is underneath the vaginal opening. The sanitary napkin 10' is then placed adjacent to the wearer by applying a sufficient pressure on the backsheet 18 of the sanitary napkin 10' toward the wearer's body, to secure the napkin 10' to the wearer.

The sanitary napkins 10, 10', 10" and 100 may be formed in any  
15 size suitable for absorption of body exudate and can have a total weight of between about 5 grams and 12 grams. Generally, the sanitary napkin 10' has a length between about 17.78 cm to about 25.4 cm (7 inches to about 10 inches). The preferred length is generally between about 12.7 cm and 20.32 cm (5 inches to about 8 inches) as  
20 this length is discreet, effective and easily placed in the correct position. The width generally between about 5.08 cm to about 10.16 cm (2 inches to about 4 inches). The preferred width is about 6.35 cm (2.5 inches) for comfort and effectiveness in absorption of menstrual fluids.

Manufacturing the sanitary napkin 10, 10', 10" and 100 is in  
25 accordance with known methods in the art for making such laminated structures. In securing the adhesive 14 to the body facing surface 15, preferably an intermediate adhesive is used to increase the adhesive's 14 bonding to the body facing surface 15. Suitable  
30 adhesives include hot melt construction adhesives, cohesive adhesives, and particularly preferred is a two sided tape identified as 465 double sided transfer tape available from the 3M Corporation.

While the invention has been discussed with reference to catamenial pads, the invention is also desirable for absorbent  
35 articles for use as incontinence protection. Furthermore, the absorbent article may be formed in various sizes and shapes to best conform to the body of the user. These and other variations of the

invention are intended to be included by the invention which is only to be limited by the scope of the claims attached hereto.

I claim:

1. An absorbent article adapted to be secured to a wearer's torso, said article comprising an absorbent and an adhesive secured adjacent to said absorbent which secures said absorbent to said wearer's torso, said article having a total weight of greater than about 5 grams.
2. The absorbent article of claim 1 further comprising a liquid-impermeable baffle secured to said absorbent.
3. The absorbent article of claim 1 wherein said adhesive is a hydrogel.
4. The absorbent article of claim 1 wherein said adhesive has a loss modulus between about  $0.5 (10^4)$  dynes/cm<sup>2</sup> to about  $20 (10^4)$  dynes/cm<sup>2</sup>.
5. The absorbent article of claim 1 wherein said adhesive has a storage modulus of between about  $0.2 (10^4)$  dynes/cm<sup>2</sup> to about  $45 (10^4)$  dynes/cm<sup>2</sup>.
6. The absorbent article of claim 1 wherein said adhesive has a loss modulus between about  $0.5 (10^4)$  dynes/cm<sup>2</sup> to about  $20 (10^4)$  dynes/cm<sup>2</sup> and a storage modulus between about  $0.2 (10^4)$  dynes/cm<sup>2</sup> to about  $45 (10^4)$  dynes/cm<sup>2</sup>.
7. A self supporting absorbent article having an outer periphery and adapted to be secured to a wearer's torso comprising:
  - a. a liquid-permeable topsheet;
  - b. a liquid-impermeable backsheet;
  - 5 c. an absorbent disposed between said topsheet and said backsheet, said absorbent having a first surface disposed toward said topsheet and a second surface disposed toward said backsheet, said absorbent having a perimeter located inward from said outer periphery of said article; and
  - 10 d. an adhesive secured to said topsheet for securing said absorbent article to said wearer's torso.

8. The absorbent article of claim 7 wherein said article has a total weight greater than about 5 grams.
9. The absorbent article of claim 7 further comprising a removable member releasably secured to said adhesive.
10. The absorbent article of claim 7 wherein said adhesive has a loss modulus between about  $0.5 (10^4)$  dynes/cm<sup>2</sup> to about  $20 (10^4)$  dynes/cm<sup>2</sup>.
11. The absorbent article of claim 7 wherein said adhesive has a storage modulus between about  $0.2 (10^4)$  dynes/cm<sup>2</sup> to about  $45 (10^4)$  dynes/cm<sup>2</sup>.
12. The absorbent article of claim 7 wherein said adhesive has a loss modulus between about  $0.5 (10^4)$  dynes/cm<sup>2</sup> to about  $20 (10^4)$  dynes/cm<sup>2</sup> and a storage modulus between about  $0.2 (10^4)$  dynes/cm<sup>2</sup> to about  $45 (10^4)$  dynes/cm<sup>2</sup>.
13. The absorbent article of claim 7 wherein said adhesive is secured within about 3 centimeters from said perimeter of said absorbent.
14. The absorbent article of claim 7 further comprising a wicking layer disposed between said topsheet and said backsheet for routing fluid from a user's body to said absorbent.
15. The absorbent article of claim 14 wherein said wicking layer is disposed adjacent to said second surface of said absorbent, said wicking layer having a wicking rate greater than said second surface.
16. The absorbent article of claim 7 wherein said adhesive is a hydrogel superimposed over less than 85 percent of said topsheet.
17. A self-supporting absorbent article comprising:
  - a. a body facing surface;
  - b. a liquid-impermeable backsheet;

5 c. an absorbent disposed between said body facing surface and said backsheet, said absorbent having a first surface disposed toward said body facing surface and a second surface disposed toward said backsheet, said first and second surfaces each having an aperture formed therethrough; and

10 d. an adhesive secured to said body facing surface for securing said absorbent article to a human torso.

18. The absorbent article of claim 17 wherein said absorbent article has a longitudinal axis, said aperture is coaxially aligned in said first and second surfaces and is centered along said longitudinal axis.

19. The absorbent article of claim 17 further comprising a wicking layer disposed between said body facing surface and said backsheet.

20. The absorbent article of claim 17 wherein between about 5% to about 95% of said backsheet is secured to an adjacent layer.

21. A self-supporting absorbent article having an outer perimeter comprising:

a. a body facing surface wherein a portion of said surface includes a liquid-permeable topsheet;

5 b. a liquid-impermeable backsheet, which partially overwraps said topsheet and is secured thereto;

c. an absorbent disposed between said topsheet and said backsheet, said absorbent having a first surface disposed toward said topsheet and a second surface disposed toward said backsheet; and

10 d. an adhesive secured to a portion of said backsheet which overwraps said body side surface for securing said absorbent article to a human torso.

22. The absorbent article of claim 21 wherein said backsheet overwraps said topsheet a distance of about 0.1 millimeters to about 30 millimeters from said outer perimeter.

23. The absorbent article of claim 21 further including a wicking layer disposed between said topsheet and said backsheet.

24. A self-supporting sanitary napkin capable of absorbing body fluid from a woman's vagina comprising:

a. a liquid-permeable topsheet having a body side surface;

b. a liquid-impermeable backsheet;

5 c. an absorbent disposed between said topsheet and said backsheet, said absorbent having a first surface disposed toward said topsheet and a second surface disposed toward said backsheet, said first and second surfaces having a coaxially aligned aperture formed therethrough for routing said body fluid from said vagina

10 to said second surface, said sanitary napkin having a flattened front portion designed to be positioned approximately forward of said vagina and a rearward portion having an upraised area designed to be positioned approximately rearward of said vagina; and

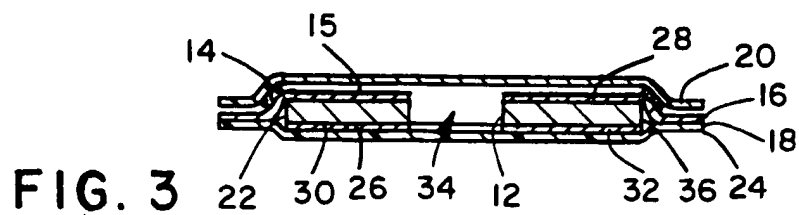
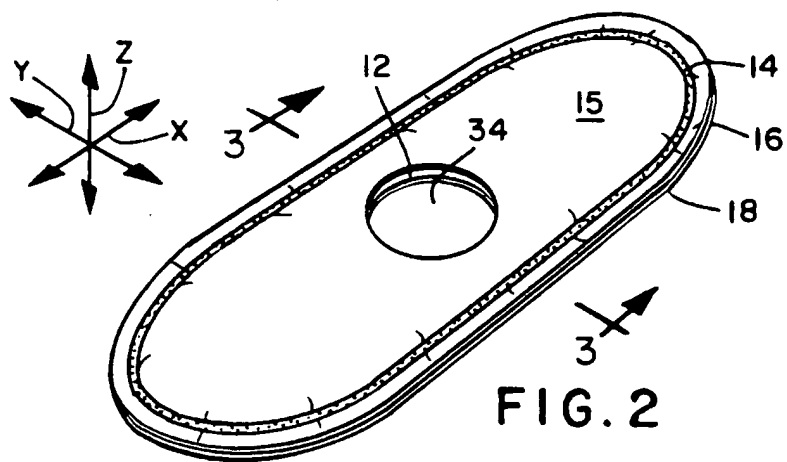
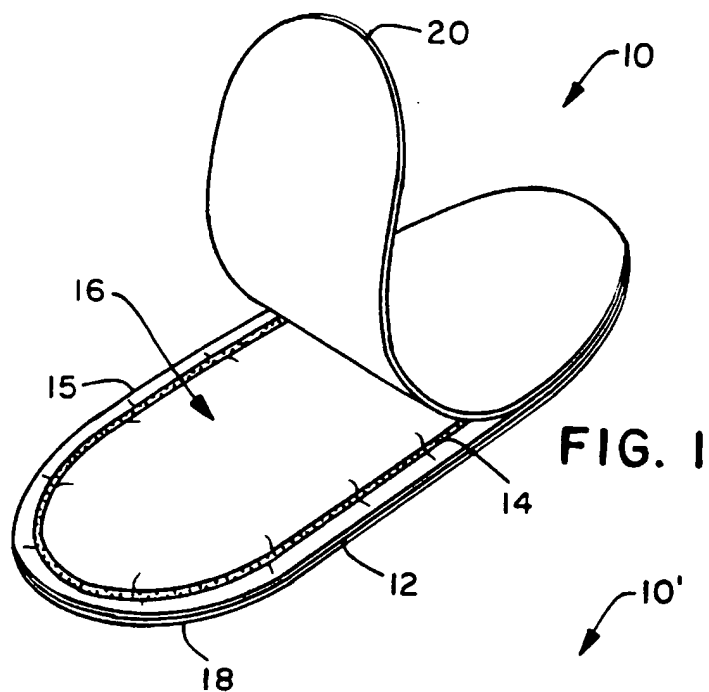
15 d. an adhesive secured to said body side surface for securing said sanitary napkin to a human torso.

25. The sanitary napkin of claim 24 wherein said sanitary napkin has a longitudinal axis and said aperture is centered along said longitudinal axis.

26. The sanitary napkin of claim 24 wherein said adhesive has a loss modulus between about  $0.5 (10^4)$  dynes/cm<sup>2</sup> to about  $20 (10^4)$  dynes/cm<sup>2</sup> and a storage modulus between about  $0.2 (10^4)$  dynes/cm<sup>2</sup> to about  $45 (10^4)$  dynes/cm<sup>2</sup>.

27. The sanitary napkin of claim 24 wherein said adhesive is a hydrogel.





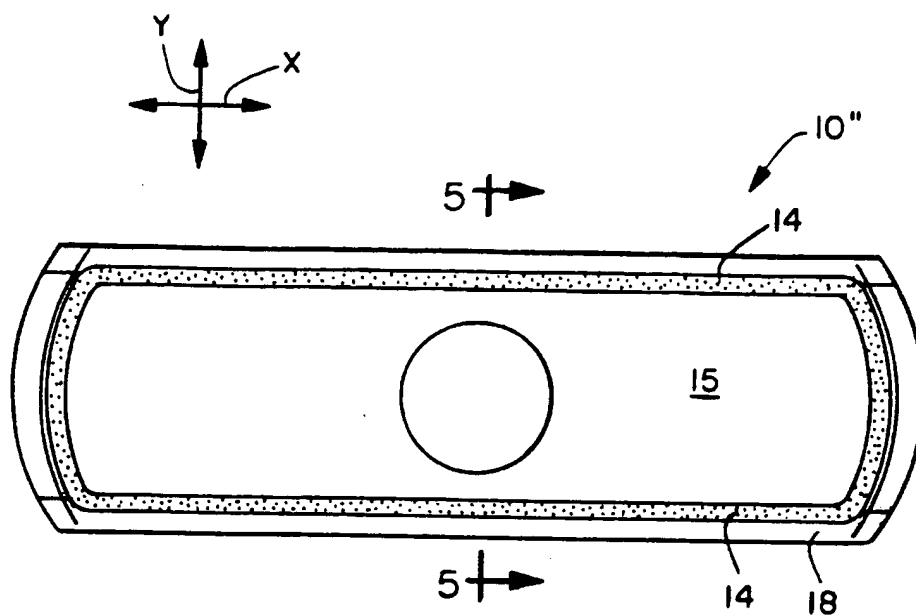


FIG. 4

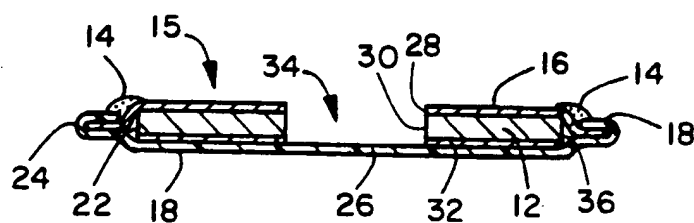


FIG. 5

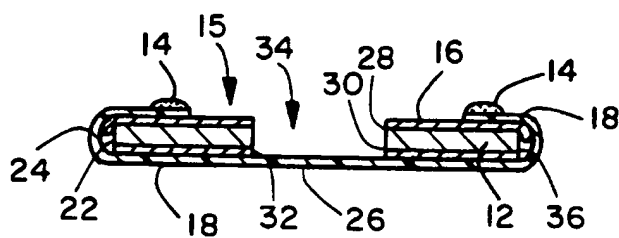


FIG. 6

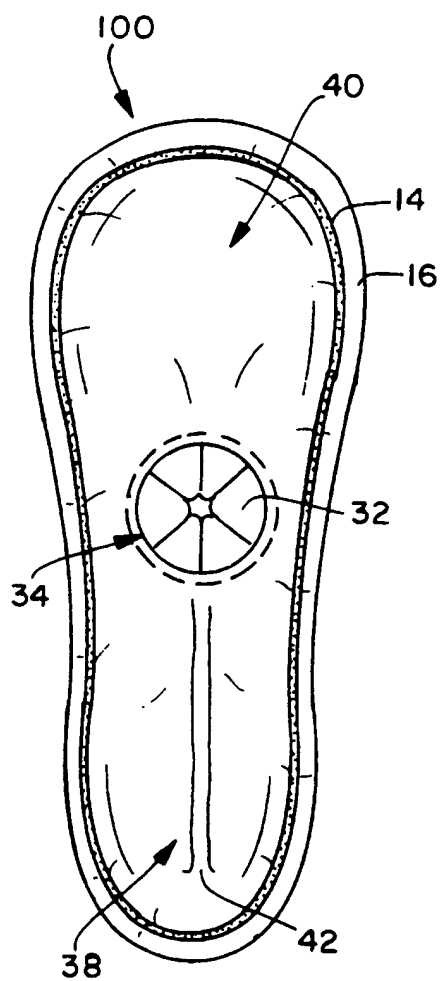


FIG. 7

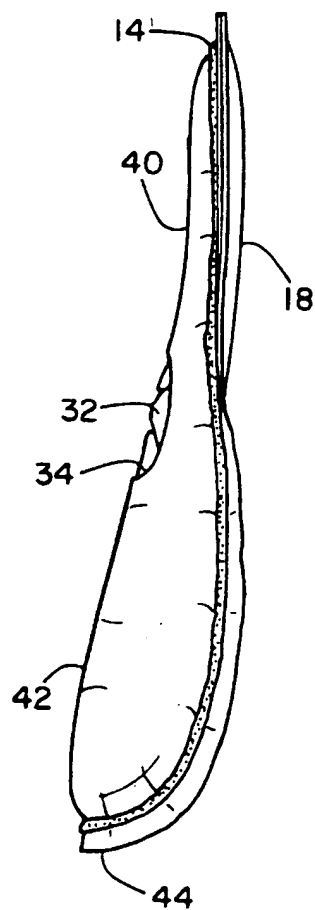


FIG. 8

## INTERNATIONAL SEARCH REPORT

 Intern al Application No  
 PCT/US 94/14512

 A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 6 A61F13/58 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,5 114 419 (DANIEL ET AL) 19 May 1992 see column 2, line 29 - line 68; claims 1,6; figures 1-3	1,2,21, 22
Y	---	7-15, 17-20
Y	EP,A,0 119 919 (LABORATOIRES BIOTROL) 26 September 1984 see page 3, line 33 - page 5, line 25; claims; examples	7-15, 17-20
A	GB,A,2 133 987 (YUTAKA YAMADA) 8 August 1984 see page 2, line 115 - page 5, line 36; figures --- -/--	7-15, 17-20, 24,25

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

13 April 1995

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 94/14512

C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,35 35 574 (DIETE) 9 April 1987	1,2,7-9, 13,17, 18,20,21
Y	see the whole document	4-6, 10-12, 16,19, 22-27
Y	--- US,A,4 593 053 (JEVNE ET AL) 3 June 1986 cited in the application see the whole document	4-6, 10-12,16
Y	--- US,A,4 673 403 (LASSEN ET AL) 16 June 1987  see column 5, line 42 - column 7, line 65; figures	14,19, 23-27
Y	--- US,A,4 701 177 (ELLIS ET AL) 20 October 1987 see column 5, line 37 - line 64; figures 12-14 -----	22

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page 2 of 2

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 94/14512

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-5114419	19-05-92	NONE	
EP-A-119919	26-09-84	FR-A- 2542608	21-09-84
GB-A-2133987	08-08-84	DE-A- 3333245	26-07-84
		FR-A- 2539617	27-07-84
		SE-B- 458741	08-05-89
		SE-A- 8306965	25-07-84
		US-A- 4731065	15-03-88
DE-A-3535574	09-04-87	NONE	
US-A-4593053	03-06-86	CA-A- 1263783	05-12-89
		EP-A, B 0184470	11-06-86
		JP-C- 1858892	27-07-94
		JP-A- 61179280	11-08-86
US-A-4673403	16-06-87	NONE	
US-A-4701177	20-10-87	US-A- 5074856	24-12-91

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